Claim Rejections – 35 USC §103

3. Claims 1, 4-6, 8, and 11-16 have been rejected as being unpatentable over CS 274995 (CS'995) in combination with US 6,194,821 (Nakamura) and Jen et al., *J. of Chrom. A*, Vol. 796:283-288 (1998). The Examiner notes in her present letter that the rejection is as applied in her previous Office Action, dated November 24, 2009, incorporated herein. The Applicant respectfully traverses the Examiner's rejections, as explained below.

4. In regard to the cited CS'995 document, the applicant respectfully advised the Examiner that the English translation of said document she provided to the applicant may be inaccurate. The applicant has not compared the texts in detail, but already the first sentence on page 1 of the English translation relates to an "acid" that should be in the reaction mixture, but the Czech original uses the word "kyslikem", which means oxygen and not to acid.

5. It is generally known to a person skilled in the art that hydrogen peroxide may form reactive radicals in aqueous environment, particularly when irradiated by UV (pages 2-3 of the instant specification). The instant invention aims at providing a technique for enhancing said generation of hydroxyl radicals in a UV-irradiated aqueous hydrogen peroxide. The cited documents do not relate to the same objective as the instant invention, as summarized in the following table.

Feature	The invention	CS'995	Nakamura
aqueous system	+	+	-
peroxide	+	?	-
radicals	+	-	+
enhancement	+	-	-

CS'995 does not relate to the enhancement of radicals formation, and even does not relate to any radicals at all. It aims at degrading organic compounds by UV, and exemplifies cases with and without peroxide, whereas peroxide lowers the efficiency of the desired process (further discussed in more detail below in this letter). Nakamura does not relate to the enhancement of radicals formation from peroxide, no peroxide is involved – and even no aqueous system is ever considered; radicals are mentioned in one of 27 examples. Even if radicals exist in the published systems, no method for influencing their quantity is taught or even hinted in any of the publications.

The method according to the invention attains said goal of enhancing the radical formation in the irradiated aqueous peroxide by including three simple steps: injecting oxygen or air, supplying suspended magnesium oxide, and adjusting pH to be slightly alkaline. The following table shows which of the three critical steps were considered in the cited publications:

Step	The invention	CS'995	Nakamura
inject O_2	+	+	-
MgO	+	-	+
pH	+	?	-

Not even two of three critical steps of the instant method are considered in any of the cited documents, and no overlap can be seen between the two publications at least in one of the features.

The Examiner cites CS'995 and Nakamura to show that the instant invention would have been obvious to a person skilled in the art in the time of the invention. The applicants believe that neither of the two documents relates to the objective of the invention, namely to the enhancement of the radicals generation in the UV-irradiated aqueous peroxide, and further that neither of the documents relates to the critical steps of the instant method, namely to injecting oxygen, providing magnesium suspension, and adjusting the pH to become slightly alkaline. It can be seen in the tables above that there is no overlap between the two cited documents in regard to the critical features characterizing either the field of the invention or the steps for attaining the invention objective. Even if CS'995 were considered by a skilled person as an information source, which is improbable, Nakamura would have never been considered, and there would not be any reason to combine it with CS'995; but even if combining (in hindsight) Nakamura with CS'995 -- the combination could not have provided the instant invention.

Nevertheless, after the present amendments, the independence of the instant invention on the cited techniques is still more graphic, as summarized in the following table.

Features	The invention	CS'995	Nakamura
aqueous system	+	+	none
peroxide	+	better without	none
enhancing radicals	+	none	none
injecting O_2	+	+	none
suspending MgO	+	none	none
pH of 7.2 – 9.7	+	not relevant	none
UV broad band	+	+	excimer 222 nm

All existing metals are used as catalysts in some chemical reactions, but each of them under specific physico-chemical conditions. A person skilled in the art of catalysis knows that physical structure of catalysts, such as the specific surface area, is not less important than their chemical compositions. Therefore, a publication does not teach a catalyst only because it mentions the name of an element. Nakamura's MgO is irrelevant for the techniques taught in CS'995 and in the instant invention. Moreover, when relating to the information sources, it must be also taken into consideration that the subject of using UV light for treating water or degrading organic materials comprises an immensely large pool of publications, offering innumerable combinations of conditions and catalysts. It is evident that Nakamura has in fact nothing in common with the present invention, and that, however said two cited teachings are combined, the present invention comes out as non-obvious over the prior art.

Relation to the Examiner's arguments

6. Although the claims have now been amended to restrict the subject matter to the most preferred embodiments of the instant invention, while believing that the restrictions address the Examiner's rejections and distinguish the instant invention still better from prior art, the applicant wishes to relate to the Examiner's arguments which

might be considered as pertinent to some of the features of the invention as defined in the amended claims.

7. The Examiner has noted (lines 5-9 on page 4, her last letter) that Nakamura teaches titanium oxide and magnesium oxide, so that Nakamura's MgO could have been used in CS'995 to replace the transition metal catalysts. However, Nakamura used Ti and Mg in catalyzing the decomposition of chlorinated toxins by irradiating with an excimer lamp, which is a technique so different from both the instant technique and the technique of CS'995 that there was no reason for a person skilled in art to consider Nakamura, or to use some of many features described by Nakamura. The excimer lamp (see, for example, http://en.wikipedia.org/wiki/Excimer_laser or http://www.ushio.com/products/semiconductor/excimer.htm) provides narrow band light around a single wavelength, such as 126, 146, 172, 222, 282, and 308 nm; Nakamura teaches a wavelength of 222 nm or below (line 36 at col. 2). The instant technique uses the UV radiation having a broad wavelength band from 190 to 390 nm (amended claims), which is provided by a classic mercury UV lamp (Example 1 of the instant specification); in contrast, Nakamura uses a laser with a complex electrical circuitry (claims, Fig. 29). Nakamura relates to the field of chlorinated toxins, whereas the instant technique relates to biocidal composition and CS'995 to degradation of complexing agents, like innocuous EDTA. Both the instant technique and CS'995 relate to aqueous liquids, whereas Nakamura relates to organic gas or liquid (lines 37-57 at col. 2), never using aqueous system. When relating to MgO, in merely one of 29 examples, Nakamura relates to an immobilized MgO (part 88 in Fig. 8) and contacts it only with organic gas (number 74 in Fig. 8) – and not with any liquid, let alone aqueous liquid. Oxygen or air are not injected to the system; if present at all, the air passively diffuses to the system (second paragraph at col. 9). Furthermore, the complicated and expensive excimer technology, limited to small reaction volumes, would be hardly considered by a skilled person searching for processing tons of galvanic waste waters or tons of sea ballast water. However, if trying (in hindsight) to replace some features in CS'995 with Nakamura's features, there would be many features other than Mg that could be considered, such as using Ti, using immobilized MgO instead of suspended MgO, employing lower UV wavelength, etc.

8. The Examiner relates to the experimental examples in CS'995, some of which do use and some do not use peroxide (lines 1-6 on page 5, her last letter), saying that examples of preferred embodiments do not teach away from a disclosure of non-preferred embodiments (citing MPEP §2123). The verbally preferred embodiment seems to include peroxide in CS'995, which should not, according to the Examiner, teach away from the non-preferred embodiment, which is avoiding the peroxide. Avoiding the peroxides is, thus, not taught away according to the Examiner. The applicant completely agrees with the Examiner, and even believes that the absence of the peroxide is advantageous, as a skilled person can see in the Examples avoiding the peroxide (for example, Example 3 achieves much better results than Example 4, the former avoiding the use of peroxide). Therefore, a question mark was filled to CS'995 in the table comparing the techniques above, where the peroxide is related to. An expert would rely on quantitative results and not on verbal proclamations.

9. The Examiner states (last two paragraphs on page 9 of her letter) that Nakamura shows the identical abilities of MgO and titanium oxide [in the excimer decomposition of chlorinated compounds], which proves that MgO would not have destroyed what CS'995 wants to do, absent evidence to the contrary. The evidence to

the contrary is the known fact that identity in behavior of two chemical elements in one situation does not necessitates an identical behavior in other situations – a skilled person knows it, otherwise all the elements in the Mendelev table would differ only by name but could not be identified as distinguishable entities. Similar behavior of Ti and Mg in breaking C-Cl bond in gaseous chlorinated organic materials irradiated by excimer lasers do not necessarily imply the same behavior in breaking O-O bond (hydrogen peroxide has -O-O- bond) in inorganic material irradiated by classic UV lamp in liquid aqueous environment. Further, it would have been obvious to a person skilled in the art that MgO would be dissolved and sequestered by EDTA when added to the system of CS'995, and would not exist any more in the form of Nakamura's powder.

10. The Examiner states (the last paragraph on page 4 of her letter of 24 November 2010) that "*CS'995 teaches a method for enhancing the generation of hydroxyl radials (OH*) at ambient temperature (=maintained at 25°C)[page 7, line 18]...*". The applicant cannot find the mentioned teaching at the specified site of the document, nor anywhere else in the document. It is respectfully believed that the Examiner may have misunderstood the text, because the document seems to entirely lack the word "radicals".

11. The Examiner states (page 8 of her letter of 24 November 2010) that it would have been obvious to modify the catalyst described by CS'995 with Nakamura's MgO. Firstly, Nakamura relates to different technology, and a person skilled in art would hardly filter up the Nakamura's text till finding the words "magnesium oxides" resulting in using MgO, because magnesium oxide in Nakamura is used as immobilized powder for breaking chlorinated toxins in gas state irradiated by a UV laser, and not as aqueous suspension for breaking inorganic peroxide irradiated by a broad UV band (for UV band, see also CS'995: line 15 on page 4 of the translation, and new instant claim 1: step iv). As already mentioned, MgO would not be obvious for using in the technique of CS'995, since the use of transition metals is generally taught as catalysts in similar situations and not earth metals; however, even if magnesium oxide were considered for replacing iron in CS'995, no resemblance with the instant invention would be achieved, because EDTA would dissolve MgO and convert it to soluble magnesium Mg-EDTA salt, and MgO suspension would disappear.

12. In regard to the feature of pH being 7.2 to 9.7, the Examiner states (page 9 of her letter of 24 November 2010, the first two paragraphs) that it would have been obvious "*because CS'995 teaches a similar liquid aqueous biocidal mixture as presently claimed. If the composition is physically the same, it must have the same properties.*" Does the examiner believe that all "similar mixtures" have the same pH? Although not being sure what the Examiner means by said physical sameness, the applicant will be grateful to the Examiner if she may show which part of the CS'995 specification teaches a biocidal mixture. The applicant believes that galvanic bath of CS'995, comprising complexing organic compounds and transition ions, is not identical to the instant biocidal mixture either physically or chemically, and it is even believed that the bath is not identical to any other biocidal mixture, because said waste water need not necessarily be biocidal, and probably will not be killing the organisms aimed to be killed by the instant mixture. Whatever the intention of the above Examiner's paragraph, she forgot to relate to the specific pH of 7.2 to 9.7. As explained in the Background of the instant specification, usual pH values employed during the UV irradiation are 2.5 to 3.0, but such acidity would be unacceptable for

the instant applications, such as preparing ballast water (the first paragraph on instant page 3). The instant method teaches adjusting the pH, the cited documents do not relate to the pH. It is surprising that radicals are formed from the peroxide even at high pH; this was achieved by developing very special conditions, comprising using MgO.

13. Therefore, in view of the above notes, the applicant submits that claims 1, 5, 8, 11-16, are novel and non-obvious in view of the cited publications. The Examiner also cites Jen et al., *J. of Chrom. A*, Vol. 796:283-288 (1998), which relates to quantifying the radicals, the subject matter of new claim 19; as claim 19 depends from claim 11 believed to be novel and non-obvious, claim 19 is also believed to be novel and non-obvious. The same holds for new claim 20 depending from claim 1.

The applicant believes that the method for enhancing the generation of hydroxyl radicals in UV-irradiated aqueous hydrogen peroxide, comprising the steps of injecting oxygen, supplying suspended MgO, and adjusting pH to be slightly alkaline, is novel and non-obvious in view of the prior art. CS'995 does not teach the claimed pH and the claimed magnesium oxide, and further leads a skilled person to avoiding peroxide. Nakamura does not relate to the same field of processing large aqueous volumes as CS'995 of the present invention, neither to the field of using peroxide for producing radicals; Nakamura relates neither to peroxide and suspended MgO, nor to the oxygen injection and pH adjustment. There would not have been any reason to combine said two publications, and even if they would have been combined, they would never provide the present method for processing large volumes of water and ridding said water of bio-contaminants, at slightly alkaline pH.

Conclusion

14. Following the present amendments and explanations, the applicant believes that the method for enhancing the generation of hydroxyl radicals in UV-irradiated aqueous hydrogen peroxide, comprising the steps of injecting oxygen, supplying suspended MgO and adjusting pH to be slightly alkaline, is novel and non-obvious in view of the prior art. The method enables to process large volumes of water, for example the sea water when providing ballast water, in a practical and cheap manner. The applicant respectfully requests favorable reconsideration and allowance of the claims, as all raised objections and rejections have been duly addressed.

Respectfully submitted

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